MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2017/2018

PTM0145 – TRIGONOMETRY

(Foundation in Information Technology/Life Sciences)

16 OCTOBER 2017
2.30p.m – 4.30p.m
(2 hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **TWO** page excluding the cover page and the Appendix.

2. Answer **ALL FIVE** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the Answer Booklet provided.

4. All necessary working steps **MUST** be shown.

Instruction: Answer all **FIVE** questions.

Question 1 [10 marks]

a. Given $z_1 = 3(\cos 80^o + i \sin 80^o)$ and $z_2 = 10(\cos 200^o + i \sin 200^o)$. Find $z_1 z_2$ and $\frac{z_1}{z_2}$. Leave your answer in polar form.

(4 marks)

b. Write the polar form of $z = \sqrt{3} - i$ and hence, find z^6. Write your answer in the rectangular form.

(6 marks)

Question 2 [10 marks]

a. Write the equation for the parabola with focus at $(4,1)$ and vertex at $(4,-4)$.

(3 marks)

b. Given the equation of the ellipse $18x^2 + 4y^2 - 108x + 16y = -106$. Find the center, vertices and foci of the ellipse and sketch the graph.

(7 marks)

Question 3 [10 marks]

a. Given $\sin\alpha = \frac{5}{6}$ and $\cos\beta = \frac{2}{7}$, where $\frac{\pi}{2} \le \alpha \le \pi$ and $\frac{3\pi}{2} \le \beta \le 2\pi$, find the exact value of

i. $\sin(\alpha + \beta)$

ii. $\tan 2\alpha$

(5 marks)

b. Solve the equation $-11 + 24\sin x = 16\cos^2 x$, where $0^o \le x \le 360^o$.

(5 marks)

Question 4 [10 marks]

a. Establish the identity $\frac{\tan\theta \cot\theta}{\csc\theta} = \sin\theta$.

(3 marks)

Continued...

b. Given a triangle with b = 4, c = 5 and A = 62°. What is the length of a and angle B and C? Round your answer to two decimal places.

(7 marks)

Question 5 [10 marks]

a. Given $A=\begin{bmatrix}0 & -3 & 1\\ 5 & -1 & 0\end{bmatrix}$ and $B=\begin{bmatrix}1 & 2\\ 0 & 1\\ 1 & -1\end{bmatrix}$, find AB.

(2 marks)

b. Use Cramer's rule to solve the following linear system:

$$2x+y-3z=19$$
$$x-2y-3z=23$$
$$x+3y+2z=-12$$

(8 marks)

End of Paper

APPENDIX

Trigonometry Identities

$$\cos^2 A + \sin^2 A = 1 \qquad \sec^2 A = 1 + \tan^2 A \qquad \csc^2 A = 1 + \cot^2 A$$

$$\cos(A+B) = \cos A\cos B - \sin A\sin B$$
$$\cos(A-B) = \cos A\cos B + \sin A\sin B$$
$$\sin(A+B) = \sin A\cos B + \cos A\sin B$$
$$\sin(A-B) = \sin A\cos B - \cos A\sin B$$
$$\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A\tan B}$$
$$\tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A\tan B}$$

$$\cos 2A = \cos^2 A - \sin^2 A$$
$$= 2\cos^2 A - 1 = 1 - 2\sin^2 A$$
$$\sin 2A = 2\sin A\cos A$$
$$\tan 2A = \frac{2\tan A}{1 - \tan^2 A}$$

$$\sin A\cos B = \frac{1}{2}[\sin(A+B) + \sin(A-B)]$$
$$\cos A\cos B = \frac{1}{2}[\cos(A+B) + \cos(A-B)]$$
$$\sin A\sin B = \frac{1}{2}[\cos(A-B) - \cos(A+B)]$$

$$\sin A + \sin B = 2\sin\frac{A+B}{2}\cos\frac{A-B}{2} \qquad \sin A - \sin B = 2\cos\frac{A+B}{2}\sin\frac{A-B}{2}$$

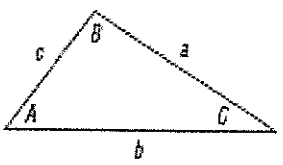
$$\cos A + \cos B = 2\cos\frac{A+B}{2}\cos\frac{A-B}{2} \qquad \cos A - \cos B = -2\sin\frac{A+B}{2}\sin\frac{A-B}{2}$$

$$\sin^2\frac{A}{2} = \frac{1-\cos A}{2} \qquad \cos^2\frac{A}{2} = \frac{1+\cos A}{2} \qquad \tan^2\frac{A}{2} = \frac{1-\cos A}{1+\cos A}$$

$$\sin\frac{A}{2} = \pm\sqrt{\frac{1-\cos A}{2}} \qquad \cos\frac{A}{2} = \pm\sqrt{\frac{1+\cos A}{2}} \qquad \tan\frac{A}{2} = \pm\sqrt{\frac{1-\cos A}{1+\cos A}}$$

$$\tan\frac{A}{2} = \frac{1-\cos A}{\sin A} = \frac{\sin A}{1+\cos A}$$

Triangles



Law of Sines:

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

Law of Cosines:

$$c^2 = a^2 + b^2 - 2ab\cos C$$
$$b^2 = a^2 + c^2 - 2ac\cos B$$
$$a^2 = b^2 + c^2 - 2bc\cos A$$

Area of a Triangle: $A = \frac{1}{2}ab\sin C = \frac{1}{2}bc\sin A = \frac{1}{2}ac\sin B$

$$A = \sqrt{s(s-a)(s-b)(s-c)} \text{ where } s = \frac{1}{2}(a+b+c)$$

Polar Coordinates

$x = r\cos\theta$

$y = r\sin\theta$

$r = \sqrt{x^2 + y^2}$

$\tan\theta = \frac{y}{x}$